❑ **Membrane** module for **cleaning membrane** filtration modules, comprises porous **membranes**, and a venturi device for providing entrained gas bubbles in a liquid flow which then passes through the **membrane**.

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ADT WO 2000018498 A1 WO 1999-AU817 19990924; AU 9961834 A AU 1999-61834 19990924; EP 1115474 A1 EP 1999-948614 19990924, WO 1999-AU817 19990924; US 2001047962 A1 Cont of WO 1999-AU817 19990924, US 2001-815966 20010323; CN 1319032 A CN 1999-811292 19990924; KR 2001079919 A KR 2001-703800 20010324
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AB WO 200018498 A UPAB: 20000524
NOVELTY - A **membrane** module (5) comprises porous **membranes** (6) arranged in close proximity to one another and mounted to prevent excessive movement, and a venturi device (12) for providing, from within the module, gas bubbles entrained in a liquid **flow**. The entrained **liquid** and **gas** bubbles move past the surfaces of the **membranes** to dislodge fouling materials.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(a) scrubbing method of a **membrane** surface using a liquid medium with gas bubbles entrained, including entraining the gas bubbles into the liquid medium by flow of the liquid medium past a source of gas, and **flowing** the **gas** bubbles and **liquid** medium along the **membrane** surface to dislodge fouling materials;

(b) method of **removing fouling** materials from the surface of porous hollow fibers mounted and extending longitudinally in an array forming a **membrane** module as disclosed above;

(c) a **membrane** bioreactor including a tank which have the **membrane** module as disclosed above; and

(d) method of operating a **membrane** bioreactor stated above by introducing feed into the tank, applying vacuum to the fiber while supplying gas bubbles.

USE - The **membrane** module is used for **cleaning membrane** filtration modules, and is also used in a **membrane** reactor.

ADVANTAGE - The advantages of the invention are:

(i) By using a venturi device, it is possible to generate gas bubbles to scrub **membrane** surfaces without the need for a pressurized gas supply;

(ii) The **liquid** and the **gas** phases are well **mixed** in the venturi and then diffuse into the **membrane** module to scrub the **membranes**. Where a jet type device is used to forcibly **mix** the **gas** into the **liquid** medium, a higher velocity of the bubble stream is produced. In treatment of wastewater, the thorough mixing provides excellent oxygen transfer;

(iii) The flow of gas bubbles is enhanced by the liquid flow along the **membrane** resulting in a large scrubbing shear force being generated, providing a positive fluid transfer and aeration with the ability to independently adjust **flow** rates of **gas** and **liquid**;

(iv) The injection of a mixture of two-phase fluid into the holes of the air distribution device can eliminate the formation of dehydrated solids and prevent gradual blockage of the holes;

(v) The injection arrangement provides an efficient cleaning mechanism for introducing cleaning chemicals effectively into the depths of the module while providing scouring energy to enhance chemical cleaning;

(vi) The module configuration allows higher packing density in a module without increasing solid packing. This adds an additional flexibility that the **membrane** modules can either integrated into the aerobic basin or arranged in a separate tank;

(vii) The positive injection of a **mixture** of **gas** and **liquid** feed to each **membrane** module provides a uniform distribution of process fluid around **membranes**, thus minimizing the feed concentration polarization during filtration;

(viii) The filtration efficiency is enhanced due to a reduced filtration resistance; and

(ix) The cleaning method can be used to the treatment of drinking water, wastewater and the related processes by **membranes**.

DESCRIPTION OF DRAWING(S) - A schematic side elevation of the **membrane** module.

Membrane module 5

Membranes 6

Venturi device 12

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